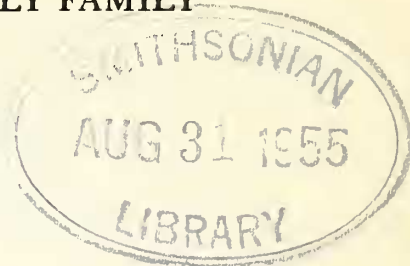


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ART. 16. REVISED CLASSIFICATION OF THE BUTTERFLY FAMILY
LYCAENIDAE AND ITS ALLIES

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INTRODUCTION

For a number of years I have been intermittently engaged in a more or less detailed revision of the classification of the butterflies of the family Lycaenidae and of their immediate relatives. Because of the labor involved in completing such a task, as well as the many demands on my time, this study promises to be long in preparation. Since, however, investigations have been conducted to a point where useful and significant results are at hand, it was thought advisable to anticipate the larger work to a certain extent by presenting this outline of the higher classification of the group as it now seems indicated.

EXPLANATION OF SPECIAL TERMS

A number of relatively unfamiliar terms have been employed in the characterizations both to make them less cumbersome and to save space. These are discussed below.

Fore leg fully formed. Refers to the development of segmentation. A fully formed fore leg has femur, tibia and five articulating tarsal segments, armed at the tip with two articulating tarsal claws, pulvilli, and so on. Compare the following.

Fore leg reduced. Through fusion, especially of the tarsal segments, and some loss of parts, especially the tarsal claws and pulvilli but also some of the leg segments at times, as well as a more or less total reduction in size, the fore leg may become slightly to extremely smaller than either middle or hind leg (cf. Fig. 1, *p-s*).

Male fore tarsus. The following terms are applied to the apex of the fused male fore tarsus in the Lycaenidae, Liphyridae and Liptenidae: *stubby-tipped* (Fig. 1, *a, b, d, e*)—in lateral view, the ventral surface is either straight (Fig. 1, *d, e*) or curved, usually irregularly, dorsad (Fig. 1, *a, b*), but never curved ventrad. A variant of this, represented by Fig. 1, *d*, has the *apex reflexed*. In those forms with the apex *produced to a ventrally curved point or hook*, the ventral surface, in lateral view, is curved ventrally, along with the dorsal surface, as in Fig. 1, *c* and *f*. In such cases the apex is never reflexed.

Antennal sulci and carinae. A single sulcus is a groove or longitudinal depression on the ventral surface of the antenna, which may be continuous or composed of a series of pits, one to a segment. Two or three sulci may run parallel to each other. The carinae are raised longitudinal ridges, between and flanking the sulci (and found only in the Nymphalides). Dr. K. Jordan, in a paper that has been most undeservedly overlooked (1898, Nov. Zool. 5: 374-415, plates 14-15), has excellently surveyed the antennal characters of the butterflies.

Endodont. A tooth arising within the curve of the tarsal claw, projecting in roughly the same direction as the distal point of the claw (cf. Fig. 1, *h, i*, with *j*, where it is missing).

Macrotrichia. A pair of long spines or "bristles" arising on the dorsal surface of the last tarsal segment, very near the tip, and occurring also in the same approximate position on the fused fore tarsi of most (or all) forms which possess such tarsi (cf. Fig. 1, *a-g*).

Spines. Used in the prevalent sense—inflexible, pointed-elongate, articulating, unicellular processes on the ventral surface of the legs.

Spurs. Likewise the standard meaning is intended—inflexible, pointed-elongate, paired, articulating, multicellular processes arising near the apex of the middle and hind tibiae, on the ventral surface (cf. Fig. 1, *q, s*).

Dorsal, ventral leg surfaces. If the legs are imagined to be directed laterally straight out from the body these directions will apply literally. In their normal position the legs, of course, have no such clear-cut orientation, but for descriptive purposes it is essential.

Shaft/club ratio. The ratio of length of longest shaft segment of the antenna over length of average club segment. In those forms with an abruptly incrassate club the shaft segments tend to be much longer than the club segments; in forms with the antennal club gradually incrassate, often barely indicated, this ratio tends to be quite low, in some forms even approaching 1.0; that is, the shaft segments very little if at all longer than those of the club. This relationship, however, is far from precise.

SUMMARY CLASSIFICATION OF THE BUTTERFLIES

The following brief survey is given in order to orient the position of the group to be discussed in detail in its relations to other butterflies. Some differences between this classification and others previously presented by various writers will be noted. I hope and believe that these changes represent an improvement, but in any case the whole scheme must still be considered as extremely tentative, since so many characters (especially those of the legs) have as yet received only very cursory attention.

The most striking conclusion to emerge from a study of the butterfly groups and their interrelations is that, with the exception of the skippers, there is extremely little indication of differential associations of the various groups. The Hesperioidea are readily separable from all the others, and clearly approach an ancestral form from which the Papilionoidea have sprung. Beyond that we may perceive but little. Each group has a number of traits peculiar to it, or nearly so—the retention of the fore tibial epiphysis in the Papiliones, presence of the larval osmeterium in the same group; the tricarinate antenna, and the pupal suspension by cremaster alone (that is, lacking the silken girdle) in the Nymphalides (though also found in a few Lycaenae); and so on. These emphasize the long evolutive isolation that each major group ancestor must have had before beginning to subdivide into the presently known members of its group. There are, however, very few characters which could possibly point to any two of these being more closely related to each other than either is to any other. The only two of the four groups which do give some evidence of a relatively closer inter-

relationship are the Lycaenac and Pierides, with a few common characters or tendencies in the antennae (sulci), tarsal claws (endodont), venation, choice of plant food (especially the favoring of Leguminosae). Yet even here the enormous differences shown in male genitalia and in the entire structure of the pattern militate strongly against associating these two groups very closely.

I. SUPERFAMILY HESPERIOIDEA

Fore wing always with 5 radials, all free and unbranched from cell; antenna very often with apiculus; fore tibia usually with epiphysis, the fore leg fully formed in both sexes; hind leg usually with at least one pair, and often two, of tibial spurs; head broad, antennal origins widely separate.

A. Group HESPERIDES. Characters as above.

Families. HesperIIDae (including *Euschemon*) and Megathymidae.

II. SUPERFAMILY PAPILIONOIDEA

Fore wing with 5 or fewer radials; when 5, always with at least two stalked; antenna never with apiculus; fore tibia may have epiphysis or not, the fore leg fully formed in both sexes or more or less reduced in males only or in both males and females; hind leg never with more than a single pair of tibial spurs, and frequently with none; head narrower, antennal origins relatively close together.

A. Group PAPILIONES. Fore legs of both sexes fully formed, with tibial epiphysis; tarsal claw (Fig. 1, *k*) almost always without endodont, very long and slightly curved; antenna below irregularly and usually feebly bisulcate or non-sulcate, very rarely unisulcate, but never carinate; M_2 of fore wing usually arising distinctly closer to M_3 than to M_1 (cubitus "quadrifid"); pupa with girdle.

Families. Papilionidae, Parnasiidae, Zerynthiidae and Baroniidae.

B. Group NYMPHALIDES. Fore legs of male, and often of female, moderately to very strongly reduced, without tibial epiphysis; tarsal claw (Fig. 1, *l*) relatively small, without (always?) endodont, moderately strongly curved; antenna below bisulcate, tricarinate; M_2 of fore wing from midway between M_1 and M_3 or from closer to the former (cubitus "trifid"); pupa without girdle.

Families. Nymphalidae, Satyridae, Brassolidae, Morphidae, Apaturidae, Argynnidae, Callinagidae, Danaidae, Ithomeidae and Libytheidae. Many of these nominal families will require careful study before they can be admitted as families without qualification.

C. Group LYCAENAE. Fore legs of male most often moderately to strongly reduced, of females never reduced; fore tibial epiphysis absent; tarsal claw (Fig. 1, *i*, *j*) relatively small and strongly curved, without an inner tooth or with a short one not reaching apex of claw (save in one group, in which males have reduced fore legs); antenna ventrally feebly unisulcate or (most common) non-sulcate, never carinate; M_2 of fore wing from nearer M_1 than M_3 or (most commonly) from midway between (cubitus "trifid"); pupa usually with girdle.

Families. Liptenidae, Liphyridae, Lycaenidae and Riodinidae. See below.

- D. Group PIERIDES. Fore legs of both sexes fully formed, without tibial epiphysis; tarsal claw (Fig. 1, *h*) relatively small, strongly curved, with an endodont always present, always long, reaching to tip of claw; antenna ventrally unisulcate or trisulcate, never carinate. Fore wing with M_2 from midway between M_1 and M_3 or from closer to former (cubitus "trifid", but note the secondary return to "quadrifid" cubitus in the Dismorphiinae); pupa with girdle.

Family. Pieridae. This family divides so nicely and almost completely into two very neatly characterized subdivisions (to which *Pseudopontia* is an intermediate), that one is tempted to raise them to family rank. The presence of the annectant *Pseudopontia* (Africa), plus the remarkable homogeneity of facies, however, would make such a step unwise, at least at present. Since some of the available characters have not before been used (tibial spurs of hind leg), or have been ignored (sulci of antennae), a review of these groups here is not inappropriate. For references, additional details and further discussion see especially Klots (1933, *Entomologia Americana* (n.s.) 12: 139-242, "A Generic Revision of the Pieridae"), as well as Talbot (1932-1935, "Lepidopterorum Catalogus", partes 53, 60, 66; 697 p. Pieridae).

Family Pieridae

- a. Subfamily Dismorphiinae. Fore wing with 5 radials; cubitus "quadrifid"; antenna trisulcate; hind tibia without spurs; tegumen much reduced; uncus 2-lobed; harpes fused ventrally.
- b. Subfamily Pseudopontiinae. Fore wing with 3 radials; cubitus "trifid"; antenna unisulcate; hind tibia without spurs; tegumen much reduced; uncus 2-lobed; harpes fused ventrally.
- c. Subfamily Pierinae. Fore wing with 3-5 radials; cubitus "trifid"; antenna unisulcate; hind tibia with spurs; tegumen not greatly reduced; uncus simple or forked only near tip; harpes not fused for any great distance.

CLASSIFICATION OF THE LYCAENAE

1. Family LIPTENIDAE

Antennae moderately long (usually) to very short (Thestorinae), ventrally non-sulcate. *Eyes* rather large, naked in all members so far as known, not (or only slightly) emarginate opposite antennal origins. *Palpi* (Fig. 1, *m*, *n*) usually porrect, the third (terminal) segment almost always very small compared with the second, either in length or in bulk; first and second segments usually ventrally spinulose. *Venation*: veins on undersurface with or without semi-erect, evenly spaced spinules; fore wing usually, but not always, with 5 radials; M_2 of fore wing usually associated more closely with M_1 than with M_3 ; hind wing with humeral vein present or absent. *Legs* (Fig. 1, *a*, *b*, *p*): male fore leg with tarsus fused to a single ventrally spinose and always stubby-tipped segment, lacking tarsal claws (except Thestorinae, q.v., with fully formed male fore leg), the ventral spines extending to beyond level of macrotrichial origins; this spinosity of two different sorts (See below); fore leg (male) with tarsus much shorter than tibia; all legs with tibia spinose at least distally, and always lacking tibial spurs; hind leg with femur shorter

than tibia (except Durbaniinae, q.v.); tarsal claw always without endodont. Known larvae lymantrioid in form and phytophagous. (Only larvae of the subfamily Lipteninae are known, however.) Africa only.

- a. Subfamily PENTILINAE. Humeral vein present on hind wing; at least some veins below on hind wing, and occasionally on fore wing as well, with semi-erect, evenly spaced, spinules; palpus III less than $1/3$ length of palpus II (Fig. 1, *n*), and very stout; ventral spines of male fused fore tarsus (Fig. 1, *a**) apically in two similar rows, the number, angle of insertion and spacing of the spines very similar in each row; spaces between the last four spines in either row less than the space (diastema) between the fourth and fifth from tip; macrotrichia of fore tarsus as long as, or longer than, terminal ventral spine; hind leg with femur shorter than tibia (Fig. 1, *p*).

Known members:† *Pentila* (sp. near *rotha* Hewitson), *Telipna* (*bimacula* Plötz), *Pentila* spp., *Telipna*, *Alaena*.

- b. Subfamily DURBANIINAE. Humeral vein present on hind wing; veins of under surface without spinules; palpus III less than $1/3$ length of palpus II, and stout; ventral spines of fused fore tarsus of male apically in two dissimilar rows, an inner (mesad) row of erect, rather regularly spaced spines, with diastema between fourth and fifth from tip, and an outer row of sparse, declivent, irregularly spaced spines; macrotrichia of fore leg shorter than terminal ventral spine; hind leg with femur subequal to, or slightly exceeding, tibia.

Known members: *Durbania* (*saga* Trimen). *D. limbata* Trimen, *D. amakosa* Trimen, examined cursorily.

- c. Subfamily LIPTENINAE Röber 1892 (modified). Humeral vein absent; veins of under surface without spinules; palpus III about $1/2$ length of palpus II and slender; apical spines on fused male fore tarsus (Fig. 1, *b*) in two dissimilar rows—an inner (mesad) row of erect, closely and rather evenly spaced spines lacking the diastema between fourth and fifth from tip, and an outer row of sparse, declivent and irregularly spaced spines; macrotrichia of fore leg shorter than terminal ventral spine; hind leg with femur shorter than tibia.

Known members: *Liptena* (*simplex* Aurivillius), *Epitola* (*cercenoides* Holland, *posthumus* Fabricius), *Larinopoda* (*lircaea* Hewitson), *Teriomima*, *Citrinophila*, *Mimacraea*, *Pseuderesia*, *Micropentila*, *Epitolina*, *Argyrocheila*, *Eresina*, *Iridana* and *Powellana*.

- d. Subfamily THESTORINAE. Humeral vein absent; veins of under surface without spinules; palpus III less than $1/3$ length of palpus II, rather slender; antennae very short, reaching about $1/3$ out on costa;

* Spines of the far row omitted for the sake of clarity, as also on Fig. 1, *c-f*.

† Throughout the paper, species in parenthesis after the generic name are those which have been examined carefully for all structural characters used in preparation of this classification. Genera listed without specific names are by virtue of having been examined cursorily—generally without preparation of a slide, merely under the dissecting microscope, for a few critical characters.

male fore leg fully formed; hind leg with femur longer than tibia.

Known member: *Thestor* (*Arrugia* Trimen*) (*basuto* Wallengren). *T. brachycera* Trimen and *T. protumnus* Linnaeus examined cursorily.

2. Family LIPHYRIDAE

Antennae never very long and may be quite short (Spalginae), non-sulcate ventrally. *Eyes* always naked, so far as known, slightly to strongly emarginate opposite antennal origins. *Palpi* variable in length but segments II and III together always over half the length of hind tibia, and may be roughly twice as long. *Venation*: humeral vein always absent (except *Megalopalpus*, Gerydinae); veins of under surface never with any spinules; fore wing with 4 or 5 radials. Legs variable in many characters. Male fore tarsus may be fully formed or fused (Fig. 1, *c*) to a single clawless segment, always ventrally spined, though weakly so in some members; when the male fore tarsus is fused, the tip is produced to a ventrally curved point (all except Poritiinae, q.v.) and the ventral spines do not reach the level of macrotrichial origins (cf. near exception, Poritiinae); middle and hind tibiae without spurs, with or without ventral spines; tarsal claw always with endodont. Known larvae are almost all limacoid in form, and carnivorous. Africa, Asia, Indo-Australia, North America.

a. Subfamily LIPHYRINAE. Legs subcylindrical; male fore tarsus fully formed, longer than fore tibia; hind tarsus I shorter than II-V; shaft/club ratio less than 1.50; at least some basal segments of antenna completely scaled; uncus not abnormally large. Africa, Indo-Australia.

(1) Tribe LIPHYRINI. Fore wing with 5 radials; M_2 from midway between M_1 and M_3 . Moderate to large species, mostly rather uncommon in collections. Probably crepuscular in habit.

Known members: *Aslauga* (*leonae* Aurivillius), *Paraslauga* Bethune-Baker, *Euliphyra* Holland, *Liphyra* Westwood.

(2) Tribe DELONEURINI. Fore wing with 4 radials; M_2 originating closer to M_1 than to M_3 . Africa only. Very rare in collections. None has been seen, the pertinent characters having been taken from other sources, chiefly Aurivillius (1920, in Seitz, "Grossschmetterlinge der Erde," 13: 346) and Murray (1935, "South African Butterflies; a Monograph of the Family Lycaenidae": 39, 58; venation plate, fig. vi).

Known member: *Deloneura* Trimen.

(3) Tribe LACHNOCNEMINI. Fore wing with 4 radials; M_2 originating midway between M_1 and M_3 . Africa only. Very "lycaenid looking" and formerly placed in the Lycaenidae.

Known member: *Lachnocnema* (*magna* Aurivillius, *bibulus* Fabricius).

* Cf. F. Hemming, 1934. "Generic Names of the Holarctic Butterflies", 1: 113; W. Peters, 1952. "A Provisional Check-list of the Butterflies of the Ethiopian Region": 110 (Genus no. 161). I am indebted to N. D. Riley, of the British Museum, for calling my attention to this synonymy.

- b. Subfamily GERYDINAE. Legs subcylindrical or distally laterally compressed and distinctly blade-like; male fore tarsus fused to a single segment produced at tip to a ventrally curved point; feebly to moderately spinose ventrally, but not distad of macrotrichial origins; fore tarsus much longer than fore tibia; macrotrichia short, not reaching apex of fore tarsus; first tarsal segment of hind leg from two to more than three times as long as segments II-V of this leg; *Megalopalpus* with humeral vein on hind wing; shaft/club ratio less than 1.5; antennae ventrally unscaled to base; uncus much enlarged, dominating the whole male genital armature. Africa, Indo-Australia.

Known members: *Megalopalpus* (*metaleucus* Karsch, *simplex* Röber?); *Gerydus* (*leos* Guérin); *Allotinus* (*horsfieldi apries* Fruhstorfer); probably *Logania* Distant.

- c. Subfamily SPALGINAE Holland. Legs subcylindrical; male fore tarsus (Fig. 1, c) fused to a single segment produced at tip to a ventrally curved point, moderately spinose ventrally but not distad of macrotrichial origins; macrotrichia relatively long, usually reaching beyond tip of tarsus; hind tarsus I subequal to or but slightly longer than tarsus II-V; shaft/club ratio less than 1.5; at least some basal antennal segments completely scaled; uncus of male genitalia not abnormally large. Africa, Asia, Indo-Australia, North America.

Known members: *Spalgis* (*epius* Westwood), *Feniseca* (*tarquinius* Fabricius), *Taraka* (*hamada* Druce). The last of these heretofore has been placed with the "blues"!

- d. Subfamily PORITIINAE. Legs subcylindrical; male fore tarsus fused to a single segment, moderately spinose ventrally, the spines extending to, but not beyond, level of macrotrichial origins; male fore tarsus stubby-tipped, the apex reflexed; macrotrichia reaching beyond the tip of the segment; hind tarsus I slightly longer than hind tarsus II-V; shaft/club ratio 2.0 (in *Poritia*, at any rate). Indo-Australia.

Known members: *Poritia* (*erycinoides* Hewitson), and perhaps one or two other genera.

In addition to the above characterizations, *Poritia* has two unusual characters: a glandular (androconial?) area on either side of the base of the male abdomen; and a group of stout, semi-erect spines on the last unmodified abdominal sternite, and to a lesser extent on the two preceding sternites.

This group should probably be referred to the Lycaenidae s.s., with which it shares a number of (unfortunately not particularly decisive) characters. However, because of an equally anomalous position there, and above all because of the absence of tibial spurs, it has tentatively been placed in the Liphyridae.

3. Family LYCAENIDAE, s.s.

Antennae of moderate length, ventrally non-sulcate, the ventral surface scaling varying from almost complete to none at all. *Eyes* naked or hairy, usually considerably emarginate opposite the antennal origins. *Palpi* (Fig.

1, o) very variable in total length and relative length of segments II and III, but always with II+III over half, and never as much as twice, the length of hind tibia, at least in material examined. *Venation* very variable. Fore wing with 3-5 radials; Sc and R₁ of fore wing not infrequently anastomosed to a greater or lesser degree; humeral vein of hind wing absent. *Legs* (Fig. 1, d-f, q). male fore tarsus (Fig. 1, d-f) fused to a single ventrally spinose segment or, rarely and spasmodically in the family, with the male fore tarsus fully formed; tibial spurs present on middle and hind legs except in *Eumaeus* (*Strymon* group, q.v.); tip of fused male fore tarsus may be stubby (Fig. 1, d-e) or produced to a ventrally curved point (Fig. 1, f), and the ventral spines may or may not occur beyond the level of macrotrichial origins; tarsal claw without endodont (Fig. 1, j), or with a short one (Fig. 1, i), only rarely (*Aphnaeus* and a few allied genera) with the endodont reaching as far as the claw tip (that is, similar to the pierid, Fig. 1, h); hind femur nearly always as long as or longer than hind tibia (except *Brephidium* and allies; possibly others, though none have been seen); middle and hind tibiae with or without spines. World wide.

The following classification must be considered very tentative and provisional. Although based on characters which seem to be of some systematic import, the resulting groups in many cases appear highly polyphyletic. The material examined is still woefully insufficient to do this matter justice.

- a. *Amblypodia* group. Juxta (of male genitalia) present; tarsal claw with endodont; male fore tarsus (Fig. 1, d) stubby-tipped, the apex reflexed, not spined below level of macrotrichial origins. Asia, Indo-Australia.
Known members: *Amblypodia* (*micale* Blanchard), *Drina* (*donina* Hewitson), probably several other nearly related genera.
- b. *Pseudodipsas* group. Juxta present (Fig. 1, u); tarsal claw with endodont; male fore tarsus produced to ventrally curved point, not spined below level of macrotrichial origins. Indo-Australia.
Known member: *Pseudodipsas* (*eone* Hewitson).
- c. *Strymon* group. Juxta absent (Fig. 1, t); tarsal claw usually with endodont (Fig. 1, i); male fore tarsus (Fig. 1, e) stubby-tipped, spined beyond level of macrotrichial origins. World wide.
Known members: *Hypochrysops* (*polycletus rex* Boisduval), *Philiris* (*gisella* Staudinger [*grandis* Smith and Kirby] and others), *Incisalia* (*niphon* Hübner and others), *Strymon* (*saepium* Boisduval and others).

NOTE. *Deudorix* (*epijarbas* Moore) and *Waigeum* (*ribbei* Röber) appear to belong here also, though both have the male fore tarsal tip produced to a ventrally curved point. They do not appear to be particularly closely related to each other, but separately to some of those listed above. *Waigeum*, especially, appears very close to *Hypochrysops* in all characters except the fore tarsal tip. Another genus provisionally placed here is *Eumaeus* (*atala* Poey), agreeing in all characters save the absence of tibial spurs which with this one exception (and *Poritia* also, should that be transferred to the family) are present in all true Lycaenidae.

- d. *Hypolycaena* group. Juxta absent; tarsal claw with endodont; male fore tarsus produced to a ventrally curved point not spined below level of macrotrichial origins. Africa, Asia, Indo-Australia.
Known members: *Hypolycaena* (*erylus tmolus* Felder), *Zeltus*, "*Pseudonotis*" (actually *Hypolycaena* s.l.) (*danisoides* de Niceville), possibly *Lepatomyrina*.
- e. *Candalides* group. Juxta present; tarsal claw usually with endodont; male fore tarsus stubby-tipped, spined below level of macrotrichial origins. Almost certainly polyphyletic, but as defined, nearly world wide.
Known members: *Candalides* (*xanthospilos* Hübner and others), *Hypaurotis* (*crysalus* Edwards), *Iolaus* (*mildbraedi* Schulze).
- f. *Lycaena* group. Juxta present; tarsal claw without endodont (Fig. 1, j); male fore tarsus produced to a ventrally curved point (Fig. 1, f), spined below level of macrotrichial origins. Another almost certainly polyphyletic group; as defined, very nearly world wide.
Known members: *Brephidium* (*exilis* Boisduval), *Ialmenus* (*evagorus* Donovan, *Poecilmitis* (*thysbe* Linnaeus), *Niphanda* (*fusca* Bremer and Grey), *Lycaena* (*phlaeas americana* Harris and others), *Heliophorus* (*epicles* Godart and others).
- g. *Plebejus* group. Juxta present; tarsal claw with endodont; male fore tarsus produced to a ventrally curved point, spined below level of macrotrichial origins. World wide.
Known members: *Glaucopsyche* (*lygdamus* Westwood), *Lycaenopsis* (*pseudargiolus* Boisduval and Leconte), *Hemiargus* (*ceraunus* Fabricius), *Leptotes* (*cassius theonus* Lucas), *Thysonotis* (*apollonius* Felder and others), *Hemiolaus* (*caeculus* Hopffer).

Includes the great majority of the "blues." The last form mentioned has formerly been placed with the "hairstreaks," which it strongly resembles in facies.

Species incertae sedis (Lycaenidae). a. A large number of important and very diverse groups have not been included above—*Anthene*, *Curetis*, *Ogyris*, *Myrina*, the neotropical "Theclas" and many others. Most of these will undoubtedly fall into one or another of the groups proposed above, but just as certainly, many will require creation of additional groups. b. Several undoubted members of the Lycaenidae s.s., and for the most part of very diverse affinities, deviate from the great bulk of the family in having males with fully functional (albeit slightly reduced in size) fore legs, just as in females. These are as yet not placeable in the above scheme, which relies heavily on the characters of the reduced male fore tarsus. Some of these species and groups are:

Tomares Rambur (Palearctic).

Artopoetes pryeri Murray (Asiatic).

Theclopsis Godman and Salvin (Neotropics).

New genus, new species (near "*Candalides*" *sublutea* Bethune-Baker). (New Guinea).

Several other groups, mostly Asiatic.

4. Family RIODINIDAE

Antennae usually very long, often ventrally flattened or lightly unisulcate, especially distally; ventrally the scaling may be complete (that is, to within 5-10 segments of the tip), partial, or absent entirely. *Eyes* naked or hairy, slightly or not at all emarginate opposite antennal origins. *Palpi* never very large, often extremely small, even invisible *in situ* from above. *Venation* variable: Fore wing with 4-5 radials; Sc and R_1 not uncommonly anastomosed for a greater or lesser distance; hind wing with humeral vein always present; a basal vein-like thickening of the costa is found in part of the family; R_s and M_1 often stalked. *Legs* (Fig. 1, g, r, s): male fore leg always strongly reduced in size, occasionally being smaller than the palpus, the tarsal segments fused (rarely 2-3 non-articulating segments may be discerned), and never ventrally spined; tibial spurs may be present (Fig. 1, s) or absent (Fig. 1, r) on middle and hind legs, though when present they are often small and require a wet mount (balsam or otherwise) in order to be seen; tarsal claw with endodont small, usually present, but absent in some members; hind legs with femur and tibia usually subequal; middle femur may be more (Fig. 1, s) or less (Fig. 1, r) than combined length of middle tibia and tarsus I. World wide.

- a. Subfamily HAMEARINAE (new). Middle leg with femur shorter than tibia+tarsus I combined; tibial spurs absent; base of hind wing costa not thickened; tarsal claw without endodont.
- (1) Tribe HAMEARINI Stichel 1928 ("stirps"). Antennal club heavily and abruptly incrassate; shaft/club ratio 2.3 (so far as examined); hind wing veins R_s and M_1 stalked. Palearctic.
Known members: *Hamearis* (*lucina* Linnaeus). Probably also *Polycaena* Staudinger.
- (2) Tribe ZEMERINI Stichel 1928 ("stirps"). Antennal club slightly and gradually incrassate; shaft/club ratio 3.0-3.2; hind wing veins R_s and M_1 usually stalked, but in many *Dodona* not so. Asia, Indo-Australia.
Known members: *Dodona* (*durga* Kollar), *Zemerus* (*flegyas javanus* Moore).
- b. Subfamily EUSELASIINAE Kirby 1871. Middle leg with femur shorter or longer than combined tibia+tarsus I; tibial spurs absent; base of hind wing costa not thickened; tarsal claw with endodont.
- (1) Tribe EUSELASIINI Kirby 1871. Middle leg (Fig. 1, s) with femur longer than tibia+tarsus I; shaft/club ratio 2.0-2.5 hind wing veins R_s and M_1 not stalked. Neotropical.
Known members: *Euselasia* (*melaphaea* Hübner), *Hades* (*noctula* Westwood).

When an author names a higher category, such as a subfamily or a family, based on a generic name it would seem unavoidable that all subordinate categories containing the type genus should be credited to him by implication, even though he did not explicitly recognize them, unless such subordinate categories had been proposed previously by another person. On this basis I attribute the present tribe to Kirby.

- (2) Tribe STIBOGINI Stichel 1928 ("stirps"). Middle leg with femur shorter than tibia+tarsus I; shaft/club ratio 3.5-3.9; hind wing veins Rs and M₁ stalked. Asia, Indo-Australia.
Known members: *Stiboges* (*nymphidia* Butler), *Holodesmus* (*satraps* Smith and Kirby).
- c. Subfamily RIODININAE. Middle leg with femur shorter or longer than combined tibia+tarsus I; tibial spurs present; base of hind wing costa thickened or not; tarsal claw with endodont.
- (1) Tribe ABISARINI Stichel 1928 ("stirps"). Middle leg with femur shorter than tibia+tarsus I; base of hind wing costa not thickened; hind wing veins Rs and M₁ stalked; shaft/club ratio 4.0-7.0. Africa, Asia, Indo-Australia.
Known members: *Abisara* (*rutherfordi* Hewitson), *Saribia* (*tepahi* Boisduval), *Taxila* (*haquina fasciata* Moore), *Dicallaneura* (*decorata consul* Fruhstorfer), *Laxita* (*orphna* Boisduval).
- (2) Tribe HELICOPINI (new). Middle leg with femur shorter than tibia+tarsus I; base of hind wing costa not thickened; hind wing veins Rs and M₁ not stalked; shaft/club ratio 5.9 (so far as examined). Neotropics.
Known members: *Helicopis* (*cupido* Linnaeus). Probably *Methonella* Westwood also.
- (3) Tribe RIODININI Grote 1895 (by implication). Middle leg with femur shorter than tibia+tarsus I; base of hind wing costa thickened; hind wing veins Rs and M₁ not stalked except in *Stalachtis*; shaft/club ratio 2.7-4.0. Nearctic, Neotropics.
Known members: *Polystichtis* (*pelarge* Godman and Salvin), *Eurybia* (*nicaea* Fabricius), *Riodina* (*lysippus lysias* Stichel), *Thisbe* (*irenea* Stoll), *Apodemia* (*carteri* Holland), *Orimba* (*myrtis gelasine* Bates), *Pandemos* (*godmanii* Dewitz), *Stalachtis* (*phlegia* Cramer). Contains the great bulk of the New World Riodinidae and is, thus, by far the largest tribe in the family.
- (4) Tribe THEOPINI (new). Middle leg with femur longer than tibia+tarsus I; base of hind wing costa thickened; hind wing veins Rs and M₁ not stalked; shaft/club ratio 2.2 (so far as examined). Neotropical.
Known member: *Theope* (*eudocia* Westwood).

Species incertae sedis (Riodinidae). The genus *Corrachia* Schaus and the curious *Styx infernalis* Staudinger are unknown to me. The latter, indeed, has been placed (quite erroneously) in the Pieridae, because of the presence of fully formed fore legs in the male. Absence of the endodont, as well as a few peculiarities of the venation, suggest that its position might not be far from the Hamearinae, especially the tribe Zemerini. It is, indeed, the only riodinid with functional male fore legs.

Species incertae sedis (Lycaenae). A number of genera, known to me only by incomplete descriptions, can not be satisfactorily placed in their proper families. Chief among these are *Teratoneura* Dudgeon; *Cooksonia* H. H. Druce; *Sheffieldia* H. H. Druce. All these are African, and appear more

likely to be referred to the Liptenidae than to any other family in the Lycaenae, but the necessary facts are not at hand.

EXPLANATION OF FIGURE 1

- a. Male fore tarsus, *Pentila* sp. near *rotha* Hewitson (Liptenidae. Africa). The spines on the far side, similar to those shown, have been omitted for clarity, as on all the figures of male fore tarsi, except *b*.
- b. Male fore tarsus, *Liptena simplex* Aurivillius (Liptenidae. Africa), right leg.
- c. Male fore tarsus, *Spalgis epius* Westwood (Liphyridae. Indo-Australia).
- d. Male fore tarsus, *Amblypodia micale* Blanchard (Lycaenidae. Indo Australia).
- e. Male fore tarsus, *Incisalia culminicola* Staudinger (Lycaenidae. Neotropics).
- f. Male fore tarsus, *Poecilmitis thysbe* Linnaeus (Lycaenidae. South Africa).
- g. Male fore tarsus, *Helicopsis cupido* Linnaeus (Riodinidae. Neotropics).
- h. Tarsal claw, *Phoebis sennae* Linnaeus (Pieridae. Neotropics).
- i. Tarsal claw, *Hypochrysops polycletus rex* Boisduval (Lycaenidae. Indo-Australia).
- j. Tarsal claw, *Ialmenus evagorus* Donovan (Lycaenidae. Indo-Australia).
- k. Tarsal claw, *Papilio philenor* Linnaeus (Papilionidae. North America).
- l. Tarsal claw, *Phyciodes tharos* Drury (Nymphalidae. North America).
- m. Palpus II and III, *Epitola posthumus* Fabricius (Liptenidae. Africa).
- n. Palpus I, II and III, *Pentila* sp. near *rotha* Hewitson (Liptenidae. Africa).
- o. Palpus II and III, *Amblypodia micale* Blanchard (Lycaenidae. Indo-Australia).
- p. Hind, middle and fore leg (left to right), *Pentila* sp. near *rotha* Hewitson (Liptenidae. Africa).
- q. Hind, middle and fore leg (left to right), *Hemiolaus caeculus* Hopffer (Lycaenidae. Africa).
- r. Hind, middle and fore leg (left to right), *Helicopsis cupido* Linnaeus (Riodinidae. Neotropics).
- s. Hind, middle and fore leg (left to right), *Euselasia melaphaea* Hübner (Riodinidae. Neotropics).
- t. Male genitalia, *Hypochrysops polycletus rex* Boisduval (Lycaenidae. Indo-Australia).
- u. Male genitalia, *Pseudodipsas eone* Felder (Lycaenidae. Indo-Australia).

Magnifications: *a-l*, scale C; *m, o-s*, scale A; *n, t, u*, scale B.

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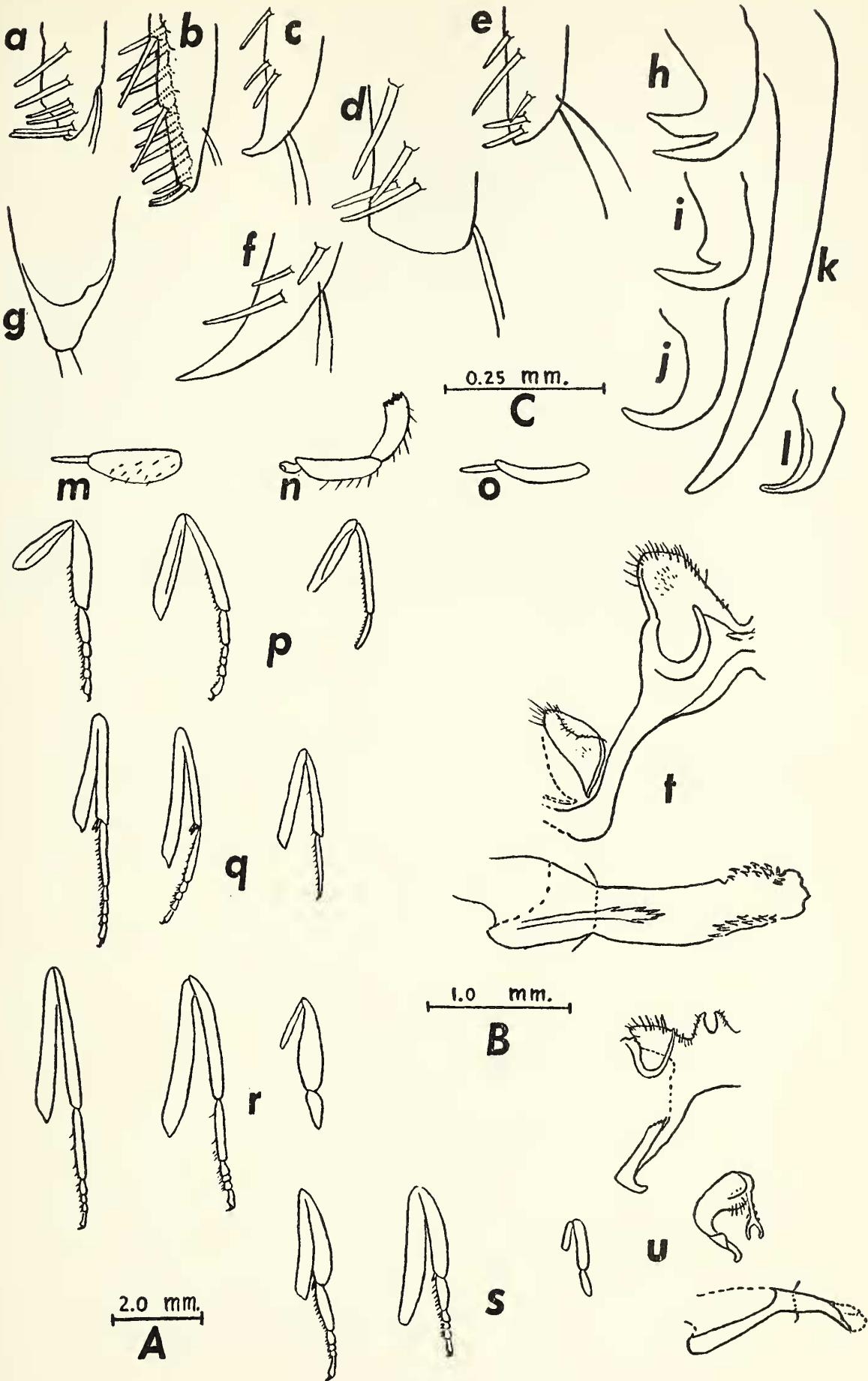


FIG. 1. STRUCTURAL DETAILS

In *a-g*, only outline, macrotrichia and ventral spines of near side (except *b*) are given.

Detail *h* is given to show long endodont of the Pieridae; *i* and *j* to compare presence and absence of endodont in Lycaenae.

In *m-o*, only the outline of the denuded segments, and the ventral spinules, when present, are given. In *p-s*, hair-scales and scales are omitted.

Details *t*, *u* are given primarily to compare presence (*u*) and absence (*t*) of juxta. Each of the two drawings shows right uncus lobe, tegumen, and falx; right half of vinculum; saccus; right valva, and penis.

In the preparation of the slides from which these drawings were made, the following procedure was employed. After softening and removing the genital structures in the usual way, the penis was removed; then the left vinculum was cut through, and the structures laid with ventral parts uppermost. Then the ventral parts (saccus and adjacent parts of vinculum, valvae, and juxta when present) were opened out to the left; the penis was next associated closely with the thus flattened structures and the whole mounted (balsam) in this flattened position. Thus the dorsal parts are seen in ventral aspect, the ventral parts in dorsal aspect, and the penis in lateral aspect. In those groups where it is feasible, this type of preparation provides the maximum exhibition of the most significant parts without distortion or foreshortening. Especially visible are the structures (when present) on the vinculum which in other types of preparation are almost always twisted or incompletely visible.

In the preparation on which detail *u* is based, complete success was not attained, as the left lower branch of the vinculum folded up to lie along the corresponding right part, and the valvae with the associated juxta became detached. Thus the saccus in the figure is seen as viewed from the right, and the valva was arbitrarily placed with its base to the top.